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PROXIMITY DETECTION SYSTEM USING FIELD EFFECT TRANSISTORS

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ABSTRACT OF THE DISCLOSURE

A sensing wire is disposed in an area to be protected such that movement of an intruder into the area results in an induced charge, either positive or negative, on the wire. The sensing wire is connected to a pair of alarm circuits and particularly to the gates of a pair of field effect transistors each of which is connected to trigger a silicon controlled rectifier in the corresponding alarm circuit. The field effect transistors are interconnected to a low voltage supply with the gates connected in common to the junction of a pair of bias resistors connected across the supply. The one field effect transistor is an "N" channel type and includes a bias resistor connected in series with its source terminal to the supply and the other transistor is a "P" channel type and includes a bias resistor connected in series with its drain terminal to the supply. The silicon controlled rectifiers have their gate circuits connected directly across the corresponding bias resistors. The bias resistor provides a low external impedance path and essentially prevents erroneous turn-on of the controlled rectifier as a result of spurious signals such as internally generated leakage currents and the like.

This invention relates to a detection system and particularly to an improved detection system for detecting selected disturbances in a given area.

Detection devices for protecting given areas against certain types of intrusion may be generally divided into two main classes: (1) a wave energy class wherein energy is transmitted at a given frequency and compared with the frequency and/or amplitude of the reflected energy and (2) a field class wherein an electric field in a given area is disturbed by any changes within the area. In the latter, an electric field is established within the area to be effected with the variation in the electric field resulting from an intruder or foreign objects within the field providing an input to a suitable detector.

The present invention is particularly directed to a disturbed field detection system employing a high impedance sensing means and particularly to an electrostatic sensing system for detecting the approach of an intruder into an area employing a novel solid state circuit coupling the sensing means to an alarm circuit or the like. The coupling circuit may also be applied to combustion detection and the like wherein ionization chambers measure the characteristic of the air and airborne matter and provide a related voltage signal. For example, applicant's co-pending application entitled Ionization Chamber Detection Apparatus which was filed on Dec. 22, 1966, with Ser. No. 604,058, discloses an improved ionization chamber system for detection combustion products with the output of the ionization chamber connected to a solid state control circuit employing a field effect transistor. The advantages of this system are that it permits use of a low voltage power supply for controlling any suitable alarm circuit connected to any power supply including the

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conventional power supply line system employed in this country.

In accordance with the present invention, an intrusion detection system intended to protect against movement of a person into the area includes a sensing antenna in the area. Any movement of an intruder into the area results in the inducement of a charge on the antenna due to the static charge on a body. The induced charge on the sensing wire, which may be either negative or positive, is converted to a related potential or voltage which is then applied to a suitable response circuit and preferably the gate of the field effect transistor which triggers a silicon controlled rectifier or the like in an alarm circuit as herein-after described.

In accordance with the novel coupling circuit aspect of the present invention, each field effect transistor is interconnected to a low voltage supply and its gate element interconnected to the high impedance sensing device. A triggered switch such as a silicon controlled rectifier has a trigger or gate circuit conductively connected directly across the bias resistor. The bias resistor provides a low external impedance path and essentially prevents erroneous turn-on of the controlled rectifier as a result of spurious signals such as internally generated leakage currents and the like.

In accordance with a particularly novel aspect of the present invention, the antenna is connected to a pair of opposite type or polarity sensitive field effect transistors for actuation of different alarm or signal means. The field effect transistor which is responsive to a positive signal is connected to the power supply in a source follower circuit having a bias resistor in series with the source terminal. The field effect transistor which is responsive to a negative signal is connected to the power supply in a source stabilized amplifier circuit with the bias resistor in series with the drain terminal. The triggered alarms are connected across the corresponding bias resistors.

The antenna may be a single or multiple wire system depending upon the size of the area to be protected. Further, where metallic objects such as a safe vault, a metal cabinet or the like is to be protected, the object itself may form the antenna.

The present invention provides an improved means to sense entrance of a person into an invalid area and a reliable solid state detection circuit for triggering of an alarm in response to the output of the high impedance sensing such as results from the movement of an intruder into an area adjacent an object to be protected and the like.

The drawing furnished herewith illustrates preferred constructions of the present invention in which the above advantages and features are clearly disclosed as well as others which will be clear from the following description of the drawing.

The drawing is a schematic circuit diagram of the present invention applied to protection of a given device against unwarranted intrusion and employing the direct coupling of silicon controlled rectifier alarm circuits to a pair of field effect transistors.

Referring to the drawing, the intrusion detection system of the present invention shown in the drawing generally includes a pair of detection or antenna wires 1 and 2 defining an antenna suitably located in an area to be protected against unwarranted intrusion and connected to a direct current source such that an electric field is created between the detection wires 1 and 2 and a suitable reference such as ground. The detection wires 1 and 2 are connected as a signalling input to a pair of